INSTITUTE FOR HOMELAND SECURITY

Sam Houston State University

THE IMPACT OF WINTER STORM URI ON HOSPITALS:

OVERCOMING A DISASTER WITHIN A DISASTER

Institute for Homeland Security

Sam Houston State University

David A. McEntire, PhD, SFHEA

Technical Paper #5

Abstract

The following paper discusses a major winter storm system (Winter Storm Uri) that was experienced in Texas from February 11 to February 20, 2021, and explores its impact upon hospital operations during this cascading disaster. It identifies various challenges resulting from freezing temperatures and the loss of utilities as well as the problems related to staffing, patient loads, and inadequate supplies. The paper mentions visible gaps in emergency capabilities, and also provides recommendations to mitigate future impacts and prepare for possible contingencies. Consequently, the goal of this report is to promote disaster resilience in hospital operations.

Introduction and Overview

An historic winter outbreak took place in Texas from February 11 to February 20, 2021. According to the National Weather Service (2021), a series of storm systems brought snow, sleet, and freezing rain to the entire state. However, it was the extreme temperatures that caused the most havoc to residents, businesses, and government organizations alike. In some cases, "temperatures plunged as much as 40 degrees below normal" (Associated Press 2021). The dip in temperatures and frigid weather lasted for days and resulted in several other complications.

The power grid, managed by the Electric Reliability Council of Texas (ERCOT), experienced a spike in demand coupled with an inability to operate under such dire circumstance. The loss of power, in turn, caused water systems to fail and pipes to break (which flooded roads, homes and businesses). When all was said and done, 69% of Texas homes and businesses lost power and 49% lost access to water (Stipes 2021).

Hospitals also fell victim to the storm and lost power and water at a time when their services were needed most. This dynamic and cascading disaster resulted in a "harrowing week" for hospitals and medical personnel in Texas (Brooks 2021).

Problem Statement

Hospitals in Texas were already busy and perhaps even overwhelmed before Winter Storm Uri affected the state in February 2021. The response to the Covid-19 pandemic had been underway for about a year by this time, and hospital staff had been working around the clock to address the needs of a high-patient count. All workers were exhausted, and some people had left their professional roles as doctors and nurses because of the excessive demands place upon them. Unfortunately, the workload for those who remained was about to increase and hospital operations became even more complicated due to Winter Storm Uri.

In anticipation of - or perhaps as a result of severe weather - hospitals looked closely at staffing and patient issues. Some hospital administrators looked closely at work schedules and took

other measures to ensure employees would be available for their shifts. For instance, employees of Olney Hamilton Hospital in North Texas were asked to sleep at the facilities in order to avoid being stranded at home and not able to commute to work. Numerous hospitals likewise cancelled non-essential, elective surgeries and many patients were discharged before the storm arrived. For instance, 30 patients were moved out of St. David's South Austin Medical Center (Harper 2021). Not everyone who was discharged had a safe way to leave or a warm place to go as the winter weather doubled down. David Huffstutler, President and CEO of St. David's HealthCare in Austin, noted the challenges associated with the release of patients due to the snow and ice on the roads (Harper 2021). Roberta Schwartz, Executive Vice President at Houston Methodist Hospital mentioned that it was heart wrenching to discharge patients since many of them lacked power. Her hospital therefore set up areas for patients to wait until they could be transported elsewhere (Harper 2021).

The release of patients was an important decision, nevertheless, since the need for medical care was about to grow in dramatic ways. The icy roads created dangerous driving conditions and the City of Austin alone had nearly 730 traffic accidents during the week of extreme winter weather. Numerous people slipped on the snow and ice, suffering broken bones that had to be treated by orthopedic surgeons. There were other instances where people were literally freezing due to the cold temperatures and loss of electricity (which was needed to heat homes). Cases of hypothermia therefore placed an additional burden on medical personnel. Ambulance calls consequently rose 300% in some areas (Childers 2021) and hospitals were the recipients of those requiring emergency medical care. In addition, after a roof of a nursing home collapsed near Lubbock, Crosbyton Clinic Hospital took in residents of that facility (Harper 2021). Hospitals were some of the only operating medical care facilities during the storm.

One of the biggest challenges for hospitals related to carbon monoxide poisonings. In an attempt to keep warm, some people lit charcoal grills in their homes or sat in a running vehicle in their garage. More than 300 carbon monoxide poisoning cases were reported in Harris County, but the entire state witnessed the worst carbon monoxide poisoning exposure in U.S. history (Trevizo et. al. 2021). Many of the 246 people who died in the storm (Harris 2022) were affected by carbon monoxide. This prompted Doctor Samuel Prater to state "with that number of patients going in, it's turning into a mini mass casualty event" (Crist 2021).

Making matters worse, hospitals were some of the only functioning medical facilities open during the extreme winter weather outbreak. Countless medical clinics, pharmacies, physicians' offices, and dialysis centers shut down due to the winter weather, road conditions, and loss of power and water. Roberta Schwartz, the Executive Vice President of Houston Methodist Hospital, said "everyone who needed services from those places came to the hospital" in record numbers (Harper 2021).

Most of the critical needs pertained to dialysis, however. In fact, "five out of six patients that need dialysis three times a week had no place to go" (Sanchez et. al. 2021). Hospital personnel therefore had to triage patient priorities. Ben Saldana, the Medical Director of Houston Methodist's emergency departments, described the process of caring for these patients:

> Every hour we go into the waiting room and ask 'Who is here for Dialysis?' Most of them raise their hands and we explain 'This is what we're going to do - we're going to evaluate your blood work, EKG, chest X-ray and decide . . . is this a life-threatening disorder at this moment or is this something we can treat and get you dialysis in the next day' (Sanchez 2021).

Another challenge pertained to clinical and food supplies. Some medical organizations, such as Tomball Heathcare, increased its "Periodic Automatic Replenishment (PAR) levels just before the storm" (TRACIE 2021). But several hospitals faced shortages of critical items. Due to the icy roads, clinical and food supplies could not be delivered to the Heart of Texas Healthcare System Hospital in Brady (east of San Angelo) (Harper 2021). Carrie Williams, a spokesperson for the Texas Hospital Association, stated there was a lack of oxygen in many locations throughout the state (Harper 2021). The shortage of this essential gas caused the Mayor of San Antonio to send out a snowplow and request that the state police help escort a liquid oxygen supplier to make needed deliveries (TRACIE 2021). The Texas Restaurant Association recognized that the hospitals were "in serious need of food for their staff and patients" and was working to provide those donations (Hayes 2021).

The loss of power was likely the most significant obstacle facing many hospitals throughout the state. Most hospitals, according Darrell Pile, the Chief Executive Officer of the Southeast Regional Advisory Council in Houston, were able to stay open because they had backup generators (Morse 2021). Others received generators from FEMA which allowed them to continue to serve their communities in spite of the community-wide loss of power. But, even under these fortuitous circumstances, hospital operations were altered in unique ways. Some of these facilities could only power essential and life-saving equipment, and heating was sacrificed in certain cases. Efforts therefore had to be made to keep patients comfortable with extra blankets. ABC News also reported that power was lost at one hospital and the generator was not functioning properly. Therefore, 5,000 vaccine doses of the Covid-19 vaccines had to be administered quickly before the temperature for storage was impacted (Pezenik and Pereira 2021). The vaccines were provided to Harris County Jail, Methodist Hospital, Rice University, LBJ Hospital and Ben Taub Hospital.

The impact of the power outage and freezing water systems also jeopardized hospital operations in different ways. The loss of power and extremely cold temperatures shut down or inhibited the delivery of water to and within hospitals. External water sources were not available at times and internal systems froze and experienced burst pipes (which flooded facilities). For example, Chambers Health in Anahuac (outside Houston) lost water due to the storm and power outage. Obvious complications included an inability to wash hands, sterilize surgery equipment or run dialysis machines. There was also no drinking water available in Dimmit Regional Hospital in Carrizo Springs (South Texas) (Harper 2021). The lack of water in Tomball Healthcare facilities rendered the fire suppression systems inoperable, which required

a facility-wide fire watch in Tomball Healthcare. Because there was no running water in two hospitals in Austin, staff had to transport human waste in trash bags for disposal (Morse 2021).

The lack of water had a negative impact on hospitals in other ways since water is needed to cool medical devices. Doug Lawson, CEO of CHI St. Luke's Health in Houston relayed that water is "key to our ability to keep air flowing through our systems and to cool many of our medical devices. So, when water is lost or we're not able to access a steady supply of water, services in the hospital can be impacted" (Harper 2021).

Creative efforts had to be undertaken to address the various problems associated with the lack of water. Most hospitals placed requests for additional bottles of water, and it was delivered if transportation could be secured and safely performed. HCA Healthcare ordered and obtained numerous 6,000-gallon tankers from Florida, North Carolina and Colorado (TRACIE 2021). Vintage Hospital in Houston also sought tankers and avoided a shutdown because the water was delivered in the nick of time (Harper 2021). William Kiefer, CEO of Chambers Health, mentioned that cleaver staff pulled water out of a swimming pool in the wellness center to refill a 275-gallon storage tank so toilets could be flushed (KERA 2021). Personnel at Houston Methodist Hospital also collected rainwater in laundry carts so toilets could be flushed (Harper 2021). In other cases, engineers were contacted to address water pressure issues in hospitals, and lines had to be flushed to ensure water was clean once Winter Storm Uri dissipated.

Overall, the diverse problems that affected hospitals were widespread. Don McBeath, the spokesperson for TORCH, said "the rural hospitals across Texas have faced similar challenges to urban hospitals with power outages, water stoppages, reduced or no food deliveries" (Harper 2021). All of these issues either shut down facilities or limited normal operations in serious ways.

Gap Assessment

It is true that many hospitals in Texas give considerable attention and effort toward emergency preparedness, because of their frequent experience with hurricanes, tornadoes and other hazards and subsequent disasters. However, Winter Storm Uri indicates that most have been too reliant on public utilities. According to Michael Wargo, the Vice President and Chief at HCA Healthcare, the loss of power illustrates the fragility of the Texas power grid and the need for emergency power sources (TRACIE 2021). Hospitals are required to have an emergency power supply system (EPSS) according to NFPA 110, which includes the provision of power within 10 seconds for critical life support systems to the red power outlets in rooms. However, it is estimated that only 20% of hospitals have generators to run HVAC (Heating, Ventilation and Air Conditioning) systems (TRACIE 2021).

Winter Storm Uri also revealed insufficient capabilities relating to water, food and other medical supplies. Furthermore, David Huffstutler, Chief Executive Officer at St. David's Hospital, said "no one hospital currently has the capacity to accept transport of a large number of patients" if another shuts down or is rendered inoperable (Snodgrass 2021).

Others also acknowledge the grim lessons generated by the extreme winter weather in Texas in February 2021. Carrie Williams of the Texas Hospital Association said "there is unimaginable pressure on everyone – patients, and staff and families. They see and feel the desperation" (Harper 2021). Natasha Kathuria, a medical doctor, commented that "We're overwhelmed, way more than we've been with Covid. The system failure has completely rocked us" (Brooks 2021).

Topic Discussion

As can be seen from the information presented above, there are a variety of issues that must be addressed to ensure that hospitals are better able to address extreme winter weather events in the future. This includes various aspects related to personnel, facilities, and operations:

- Ensure adequate routine and emergency staffing among administrators, doctors, nurses, and all other hospital personnel.
- Build capacity to house hospital staff in case transportation is dangerous or delayed.
- Identify cancellation policies for elective surgeries and treatments.
- Implement discharge procedures earlier during extreme winter weather and/or be able to care for patients who cannot leave hospital facilities.
- Anticipate a large number of patients that result from extreme winter weather events (e.g., accidents, hypothermia or carbon monoxide poisoning).
- Increase understanding of appropriate treatment of carbon monoxide poisonings.
- Implement triage processes to care for the most needed of dialysis patients.
- Store sufficient supplies of oxygen, food and water (and streamline emergency orders as needed).
- Develop necessary power capabilities (including generators and fuel) to run the hospital and address HVAC needs.
- Obtain water systems and storage for all needs and operations (e.g., drinking, fire suppression, waste removal, chillers, medical devices) and explore ways to quickly obtain water from external sources.
- Prepare, plan and undertake exercises for extreme weather events and all related contingencies.
- Hire qualified emergency management personnel who work closely with all relevant parties to ready hospitals for these and other disaster scenarios.

If these measures are taken, hospitals will be in a much better position to address similar disaster events in the future.

Way Forward

It is important to acknowledge that the dedicated efforts of employees to deal with the winter storm on top of Covid-19 is "one of the most awe-inspiring things" witnessed in hospitals in Texas (Doug Lawson in Harper 2021). But, there is ample opportunity to improve our hazard mitigation and preparedness measures in the future.

Experts have encouraged their peers in this sector "to review your plans, establish contacts in advance of a crisis, and continue to share your lessons learned so that we can transition our experiences into lessons applied" (TRACIE 2021).

David Callendar, CEO of Memorial Herman Health System, also reminds "policy makers to our regulators to people who manage resources to those of us who provide service [that we must] work as a team to make sure that this never happens again" (Childers 2021).

References

Associated Press. (2021). "Hospitals Confront Water Shortages in Winter Storm Aftermath." Spectrum News 1. https://www.spectrumlocalnews.com/tx/south-texas-el-paso/weather/2021/02/21/hospitals-confront-water-shortages-in-winter-storm-aftermath.

Brooks, Brad. (2021). "Cold, Lack of Water Overwhelm Texas Hospitals More than Covid-19 Did." Reuters. https://www.reuters.com/business/healthcare-pharmaceuticals/cold-lack-water-overwhelm-texas-hospitals-more-than-covid-19-did-2021-02-20/

Childers, Shelley. (2021). "'Disasters within the Disaster:' Houston Hospitals Face Compounding Crisis Due to Power and Water Outages." ABC 13 Eyewitness News. https://www.abc13.com/houston-hospitals-dialysis-patients-texas-winter-storm-2021-weather/10352720/

City of Austin and Travis County. (2021). "2021 Winter Storm Uri After-Action Review Findings Report."

Crist, Carolyn. (2021). "Deaths from Carbon Monoxide Rise Amid Winter Storms." https://www.webmd.com/first-aid/news/20210218/death/from-carbon-monoxide-rise-amid-winter-storms.

Harper, Karen Brooks. (2021). "An Emergency on Top of a Pandemic: Texas Hospital Workers Scramble as Winter Storm Hampered Operations." The Texas Tribune. https://www.texastribune.org/2021/02/18/texas-hospitals-power-outages-winter-storm/.

Harris, Jake. (2022). "New Report: 246 People Died in Texas Winter Storm, Including 22 in Dallas County and 11 in Tarrant County." WFAA. https://www.wfaa.com/article/weather/severe-weather/texas-winter-storm-death-toll-246-including-22-dallas-county-11-tarrant-county/287-b7d4bae5-cb35-4bf2-bab4-88c6543ed101.

Hayes, Kelly. (2021). "Beleaguered Texas Hospitals with no Water Evacuate Patients Amid Winter Storm Power Outages." Fox4News. Https://www.fox4news.com/news/beleaguered-texas-hospitals-with-no-water-evacuate-patients-amid-winter-storm-power-outages.

KERA. (2021). "Hospitals Confront Water Shortages in Winter Storm Aftermath." https://www.keranews.org/news/2021-02-22/hospitals-confront-water-shortages-in-winter-storm-aftermath.

Morse, Susan. (2021). "Texas Hospitals Deal with Winter Storm Disaster." Healthcare Finance. https://www.healthcarefinancenews.com/news/Texas-hospitals-deal-winter-storm-disaster

National Weather Service. (2021). Historic Winter Outbreak February 11-20, 2021. https://www.weather.gov/hgx/2021ValentineStorm

Pezenik, Sasha and Pereira, Ivan. (2021). "Texas Officials Scramble to Administer 5,000 Covid Vaccines after Power Loss." ABC News. https://abcnews.go.com/US/texas-officials-scramble-administer-8000-covid-vaccines-power/story?id=75911159

Sanchez, Ray, Allen, Keith, Boyetter, Chris and Siliverman, Hollie. (2021). "Texas Hospitals Grapple with Water, Staffing, and Supply Issues in Wake of Winter Storms." CNN. https://www.cnn.com/2021/02/19/us/texas-houston-hospitals-water-shortages.

Snodgrass, Erin. (2021). "Hospitals Across Texas are Suffering from Water and Heat Issues as Winter Storms Wreak Havoc Across the State." Insider. https://www.insider.com/hospitals-across-texas-are-suffering-from-water-heat-outages-2021-2.

Stipes, Chris. (2021). "New Report Details Impact of Winter Storm Uri on Texans." https://uh.edu/news-events/stories/2021/march-2021/03292021-hobby-winter.storm.php

TRACIE Healthcare Emergency Preparedness Information Gateway. (2021). Managing the Storm after the Storm: Health in Texas Recovers from Severe Winter Weather. https://files.aspratracie.hhs.gov/documents/managing-the-storm-after-the-storm-healthcare-in-tx-recovers-from-severe-winter-weather.pdf.

Trevizo, Perla, Larson, Ren and Churchill, Lexi. (2021). "Texas Enabled the Worst Carbon Monoxide Poisoning Catastrophe in Recent U.S. History." The Texas Tribune. https://www.texastribune.org/2021/04/29/texas-carbon-monoxide-poisoning/

INSTITUTE FOR HOMELAND SECURITY

Sam Houston State University

The Institute for Homeland Security at Sam Houston State University is focused on building strategic partnerships between public and private organizations through education and applied research ventures in the critical infrastructure sectors of Transportation, Energy, Chemical, Healthcare, and Public Health.

The Institute is a center for strategic thought with the goal of contributing to the security, resilience, and business continuity of these sectors from a Texas Homeland Security perspective. This is accomplished by facilitating collaboration activities, offering education programs, and conducting research to enhance the skills of practitioners specific to natural and human caused Homeland Security events.

Institute for Homeland Security
Sam Houston State University

The Impact of Winter Storm Uri on Hospitals - Overcoming a Disaster Within a Disaster © 2022 by David A. McEntire is licensed under CC BY-NC-ND 4.0

McEntire, D. A. (2022). **The Impact of Winter Storm Uri on Hospitals: Overcoming a Disaster Within a Disaster** (Report No. IHS/CR-2022-2036). The Sam Houston State University Institute for Homeland Security. https://ihsonline.org/Research/Technical-Papers/The-Impact-of-Winter-Storm-Uri-on-Hospitals